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UNIFORMLY DISTRIBUTED SOURCE, ARUU PROGRAM

Karl Z. Morgan

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OAK RIDGE NATIONAL LABORATORY
Division of
Carbide and Carbon Chemicals Corporation
Oak Ridge, Tennessee

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Subject: Uniformly Distributed Source, ARUU Program

This experiment was performed in compliance with paragraph four of a memorandum from Walter J. Williams to J. C. Franklin, dated July 2, 1948. The original outline of the experiment, as given in Appendix A, Part II, of the above memorandum, was not followed. Availability of facilities required major changes, which were approved by Dr. H. M. Roth, AEC, and Dr. W. E. Winsche, representing the RW Panel.

The sources were 1.06 grams (average) of tantalum. They were enclosed in 3/8 inch O.D. iron pipes with 1/32 inch walls after they were removed from the pile in order to prevent the spread of contamination. The dosage rate due to a single source measured with a Lauritsen electroscope was equivalent to 87 ± 2.5 milligrams of radium inclosed in a 1 mm wall platinum container. This corresponds to about 109 millicuries of tantalum. Absorption in the iron pipe was measured to be 5%.

A rectangular plot 275 by 300 yards was cleared in the Oak Ridge area near the K-25 plant. It was measured and staked at 25 yard intervals by the Engineering and Maintenance Division of Oak Ridge National Laboratory. Maximum variation of the elevations at the grid points was 9 feet. Sources were placed on stakes about 3 feet above ground level, so that the measuring instrument was visible from each source for all measuring points, with a few exceptions in the case of some of the farthest sources. The thirteenth row of sources, omitted because of topography, would have contributed less 1.6% at the center of the grid, 1.4% at the edge, and 5.7% at 100 yards from the edge. Altogether there were 156 sources used in the grid. Twenty-six sources, whose observed probable deviation from the average was $\pm 0.6\%$, were placed in the two grid rows adjacent to the path of measurement. Sources with a probable deviation from the average of 3% were used on the outer rows.

Measurements were taken with electroscopes along a line parallel to the long axis of the 275 by 300 yard rectangle so that there were five rows of sources on one side of the line of measurement and seven on the other. Readings were taken on the edges and at the center of each grid square traversed, and outside the gridded area to a distance of 100 yards as indicated in Figure 1. Observed values of the dosage rate are listed in Table 1.

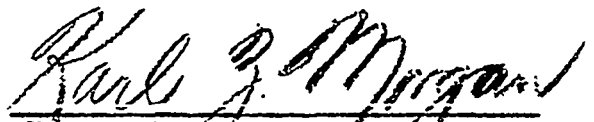
The computed values in Figure 2 were found using the absorption-scattering data from the single source experiment with La* and are only approximate for this experiment with Ta. Computed values are consistently higher than the measured values by about 8%. It is felt that this difference is due both to error in instrument calibration and to the variation introduced by making the calculations on La rather than Ta. A few of the sources were knocked off their stakes by birds during the period of measurement, but they were replaced shortly afterwards so that the number down at any one time would not produce an effect as large as the observed discrepancy.

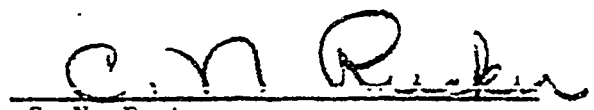
* Single Source Lanthanum Test, Central Files No. 48-7-380, July 23, 1948

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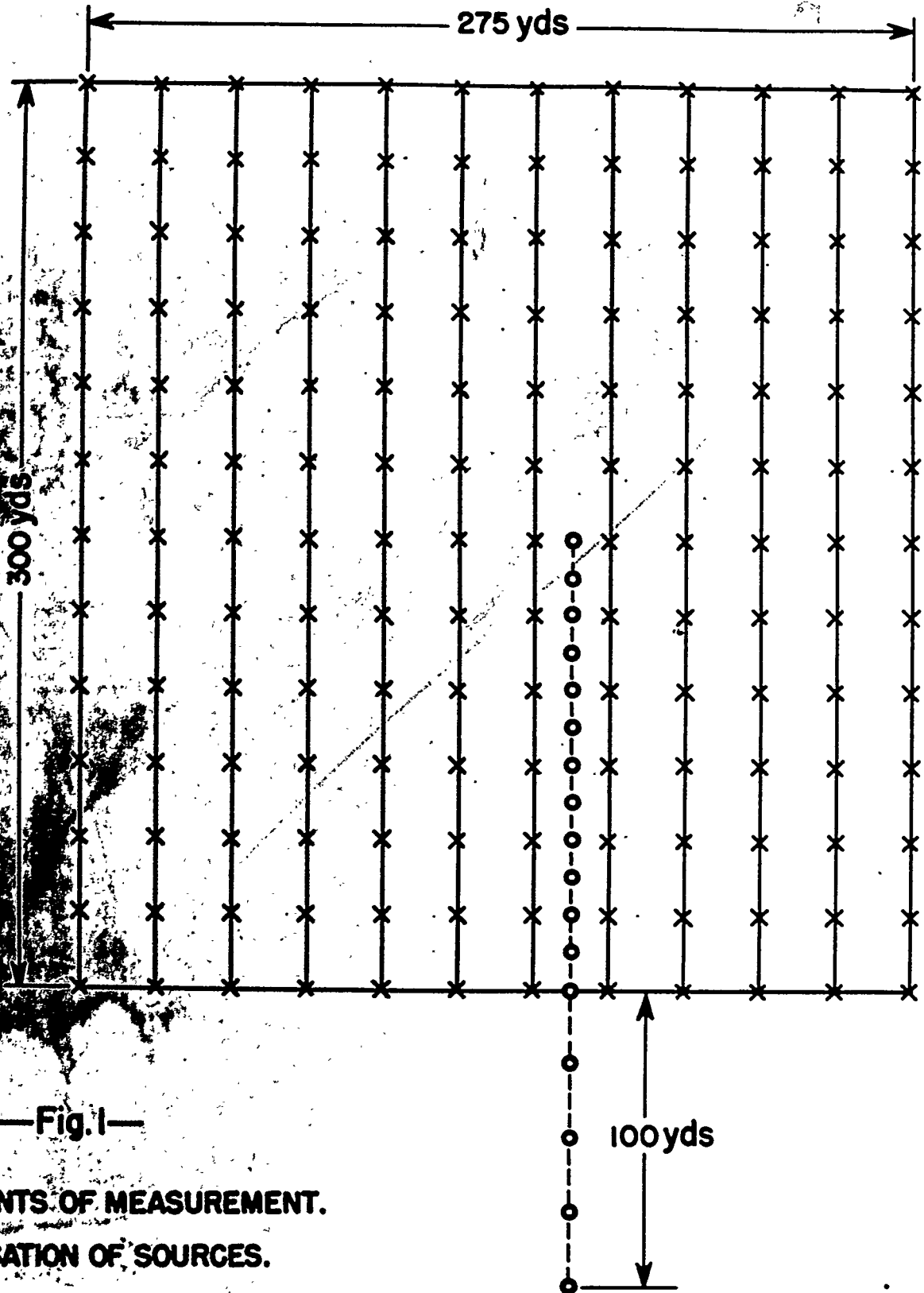
TABLE 1

Distance to Grid Center (yards)	Observed Dosage-Rate (mr/hr)	Computed Dosage-Rate (mr/hr)
250	0.14	.15
225	0.19	.22
200	0.33	.35
175	0.62	.68
150	1.72	1.87
137.5	1.63	1.78
125	2.05	2.19
112.5	1.90	1.97
100	2.16	2.31
87.5	1.89	2.07
75	2.22	2.38
62.5	1.89	2.12
50	2.25	2.42
37.5	1.88	2.15
25	2.20	2.44
12.5	2.00	2.16
0	2.22	2.44


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O POINTS OF MEASUREMENT.

X LOCATION OF SOURCES.

